WHAT IS CLAIMED IS:

1. A purified bovine uterus derived heparin-binding growth factor having the following characteristics:

5   (a) a molecular weight of about 18.9 kDa when analyzed in SDS-PAGE gels under reducing conditions,

(b) an amino terminal sequence

Gly-Lys-Lys-Glu-Lys-Pro-Glu-Lys-Lys-Val-Lys-Lys-Ser-Asp-

Cys-Gly-Glu-Trp-Gln-Trp-Ser-Val-Cys-Val-Pro.

10   (c) binds to cation exchange resins and heparin-Sepharose,

(d) is stable to acetone precipitation,

(e) is labile in acid, and

(f) has potent mitogenic activity toward
15   NIH 3T3 fibroblasts.

a

1. purified and isolated

6. A *purified and isolated* DNA sequence consisting of a sequence encoding bovine heparin binding growth factor of 168 amino acids having the following amino acid sequence:

β

Met	Gln	Thr	Pro	Gln	Tyr	Leu	Gln	Gln	Arg	Arg	Lys	Phe	Ala	Ala	15
Ala	Phe	Leu	Ala	Phe	Ile	Phe	Ile	Leu	Ala	Ala	Val	Asp	Thr	Ala	30
Glu	Ala	Gly	Lys	Lys	Glu	Lys	Pro	Glu	Lys	Lys	Val	Lys	Lys	Ser	45
Asp	Cys	Gly	Glu	Trp	Gln	Trp	Ser	Val	Cys	Val	Pro	Thr	Ser	Gly	60
Asp	Cys	Gly	Leu	Gly	Thr	Arg	Glu	Gly	Thr	Arg	Thr	Gly	Ala	Glu	75
Cys	Lys	Gln	Thr	Met	Lys	Thr	Gln	Arg	Cys	Lys	Ile	Pro	Cys	Asn	90
Trp	Lys	Lys	Gln	Phe	Gly	Ala	Glu	Cys	Lys	Tyr	Gln	Phe	Gln	Ala	105
Trp	Gly	Glu	Cys	Asp	Leu	Asn	Thr	Ala	Leu	Lys	Thr	Arg	Thr	Gly	120
Ser	Leu	Lys	Arg	Ala	Leu	His	Asn	Ala	Asp	Cys	Gln	Lys	Thr	Val	135
Thr	Ile	Ser	Lys	Pro	Cys	Gly	Lys	Leu	Thr	Lys	Ser	Lys	Pro	Gln	150
Ala	Glu	Ser	Lys	Lys	Lys	Lys	Lys	Glu	Gly	Lys	Lys	Gln	Glu	Lys	165
Met	Leu	Asp	.												168.

1. The cDNA of bovine heparin-binding growth factor having the following nucleotide sequence:

```
GAGTGGAGAG AGTAGAAGAA AGAGAGCAGG GAGTCACCGG GCGTGCGGGG      50
GCGGAGAGCA GCGGCCGCCG CGAGCACCAG CGACTTGGGT ACCTGGACTC     100
AGGGCAGAAA AACCTCTCCC GGATCAACAA AGGCAGCCTG AGCGCGCACC     150
GCTCTTTTGC GACTCCAAAA TGCAGACTCC ACAGTACCTG CAGCAACGTC     200
GAAAATTTGC AGCTGCCTTT TTGGCATTTA TTTTCATCTT GGCAGCTGTG     250
GACACCGCTG AAGCAGGAAA GAAAGAGAAA CCAGAAAAGA AGGTGAAGAA     300
GTCTGACTGT GGAGAATGGC AGTGGAGTGT GTGTGTACCA ACCAGTGGGG     350
ACTGTGGGCT GGGCACCCGC GAGGGCACCC GTACCGGAGC TGAGTGTAAA     400
CAAACCATGA AGACCCAGAG ATGTAAGATC CCCTGCAACT GGAAAAAGCA     450
ATTTGGAGCG GAGTGCAAAT ACCAGTTCCA GGCCTGGGGA GAATGTGATC     500
TGAACACGGC TCTGAAGACC CGAACTGGGA GCCTGAAGCG AGCCCTCCAC     550
AACGCCGACT GCCAGAAGAC AGTCACCATC TCCAAGCCCT GTGGCAAGCT     600
GACCAAGTCC AAACCTCAAG CAGAATCTAA GAAGAAGAAA AAGGAAGGCA     650
AGAAACAGGA GAAGATGCTG GACTAAAAGC CACCACCTTC CGTGGACCAT     700
GAAAAGGACA TCAGCAAACA CGATCAGTTA ACTATTGCAT TTATATCTAC     750
CGTAGGCTTT TTATTCAAAA ATTATCTATA GCTTAAGTAC ACAATAGGCA     800
GAAACAAAAT GAAAAGAAAA ATTTTGTAGT AGCATTTTTT TTAAATGTAT     850
CAATATACCA TAGTACCACT AGGGACTTAT AATAGAGGAC TGTAATCCTA     900
TTTAGAATGT TGACTTATAG TACATGTTAA GTGATAGAAA ACTGAGGTAA     950
GTTTTTTGAA GTTATGTGAT ATTTTACATT ACATTTTTTT TTACATTTTT    1000
TTCTTTTGGC AGCAATTTAA ATGTTATGAC TATGTAAACT ACTTCTCTTG    1050
TTAGGTAATT TTTTTCACCT AGACTTTATT TCCCAATTGA GAAAAATATC    1100
TACTAAACAA AGCAGCAATA AAATATGATC ATCCTATCTG AGGAAAATAT    1150
CTCTTTTTCT GCCAGTGGAT TTTTAAAAAA TTGTAGTCAA CAAAAT        1196.
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2. A human placenta derived heparin-binding
growth factor of 168 amino acids having the following
amino acid sequence:

Met	Gln	Ala	Gln	Gln	Tyr	Gln	Gln	Gln	Arg	Arg	Lys	Phe	Ala	Ala	15
Ala	Phe	Leu	Ala	Phe	Ile	Phe	Ile	Leu	Ala	Ala	Val	Asp	The	Ala	30
Glu	Ala	Gly	Lys	Lys	Glu	Lys	Pro	Glu	Lys	Lys	Val	Lys	Lys	Ser	45
Asp	Cys	Gly	Glu	Trp	Gln	Trp	Ser	Val	Cys	Val	Pro	Thr	Ser	Gly	60
Asp	Cys	Gly	Leu	Gly	Thr	Arg	Glu	Gly	Thr	Arg	Thr	Gly	Ala	Glu	75
Cys	Lys	Gln	Thr	Met	Lys	Thr	Gln	Arg	Cys	Lys	Ile	Pro	Cys	Asn	90
Trp	Lys	Lys	Gln	Phe	Gly	Ala	Glu	Cys	Lys	Tyr	Gln	Phe	Gln	Ala	105
Trp	Gly	Glu	Cys	Asp	Leu	Asn	Thr	Ala	Leu	Lys	Thr	Arg	Thr	Gly	120
Ser	Leu	Lys	Arg	Ala	Leu	His	Asn	Ala	Glu	Cys	Gln	Lys	Thr	Val	135
Thr	Ile	Ser	Lys	Pro	Cys	Gly	Lys	Leu	Thr	Lys	Pro	Lys	Pro	Gln	150
Ala	Glu	Ser	Lys	Lys	Lys	Lys	Lys	Glu	Gly	Lys	Lys	Gln	Glu	Lys	165
Met	Leu	Asp													168

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3. A bovine uterus derived heparin-binding growth factor of 168 amino acids having the following amino acid sequence:

```
Met Gln Thr Pro Gln Tyr Leu Gln Gln Arg Arg Lys Phe Ala Ala   15
Ala Phe Leu Ala Phe Ile Phe Ile Leu Ala Ala Val Asp The Ala   30
Glu Ala Gly Lys Lys Glu Lys Pro Glu Lys Lys Val Lys Lys Ser   45
Asp Cys Gly Glu Trp Gln Trp Ser Val Cys Val Pro Thr Ser Gly   60
Asp Cys Gly Leu Gly Thr Arg Glu Gly Thr Arg Thr Gly Ala Glu   75
Cys Lys Gln Thr Met Lys Thr Gln Arg Cys Lys Ile Pro Cys Asn   90
Trp Lys Lys Gln Phe Gly Ala Glu Cys Lys Tyr Gln Phe Gln Ala  105
Trp Gly Glu Cys Asp Leu Asn Thr Ala Leu Lys Thr Arg Thr Gly  120
Ser Leu Lys Arg Ala Leu His Asn Ala Asp Cys Gln Lys Thr Val  135
Thr Ile Ser Lys Pro Cys Gly Lys Leu Thr Lys Ser Lys Pro Gln  150
Ala Glu Ser Lys Lys Lys Lys Glu Gly Lys Lys Gln Glu Lys      165
Met Leu Asp                                                   168
```

(*purified and isolated*

4. A *purified and isolated* DNA sequence consisting of a sequence
encoding human heparin binding growth factor of 168
amino acids having the following amino acid sequence:

β

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```
Met Gln Ala Gln Gln Tyr Gln Gln Gln Arg Arg Lys Phe Ala Ala    15
Ala Phe Leu Ala Phe Ile Phe Ile Leu Ala Ala Val Asp Thr Ala    30
Glu Ala Gly Lys Lys Glu Lys Pro Glu Lys Lys Val Lys Lys Ser    45
Asp Cys Gly Glu Trp Gln Trp Ser Val Cys Val Pro Thr Ser Gly    60
Asp Cys Gly Leu Gly Thr Arg Glu Gly Thr Arg Thr Gly Ala Glu    75
Cys Lys Gln Thr Met Lys Thr Gln Arg Cys Lys Ile Pro Cys Asn    90
Trp Lys Lys Gln Phe Gly Ala Glu Cys Lys Tyr Gln Phe Gln Ala   105
Trp Gly Glu Cys Asp Leu Asn Thr Ala Leu Lys Thr Arg Thr Gly   120
Ser Leu Lys Arg Ala Leu His Asn Ala Glu Cys Gln Lys Thr Val   135
Thr Ile Ser Lys Pro Cys Gly Lys Leu Thr Lys Pro Lys Pro Gln   150
Ala Glu Ser Lys Lys Lys Lys Lys Glu Gly Lys Lys Gln Glu Lys   165
Met Leu Asp                                                    168
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a   2   *Purified and isolated*

5. The cDNA of human heparin-binding growth
factor having the following nucleotide sequence:

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GTCAAAGGCA GGATCAGGTT CCCCGCCTTC CAGTCCAAAA ATCCCGCCAA    50

GAGAGCCCCA GAGCAGAGGA AAATCCAAAG TGGAGAGAGG GGAAGAAAGA   100

GACCAGTGAG TCATCCGTCC AGAAGGCGGG GAGAGCAGCA GCGGCCCAAG   150

CAGGAGCTGC AGCGAGCCGG GTACCTGGAC TCAGCGGTAG CAACCTCGCC   200

CCTTGCAACA AAGGCAGACT GAGCGCCAGA GAGGACGTTT CCAACTCAAA   250

AATGCAGGCT CAACAGTACC AGCAGCAGCG TCGAAAATTT GCAGCTGCCT   300

TCTTGGCATT CATTTTCATA CTGGCAGCTG TGGATACTGC TGAAGCAGGG   350

AAGAAAGAGA AACCAGAAAA AAAAGTGAAG AAGTCTGACT GTGGAGAATG   400

GCAGTGGAGT GTGTGTGTGC CCACCAGTGG AGACTGTGGG CTGGGCACAC   450

GGGAGGGCAC TCGGACTGGA GCTGAGTCCA AGCAAACCAT GAAGACCCAG   500

AGATGTAAGA TCCCCTGCAA CTGGAAGAAG CAATTTGGCG CGGAGTGCAA   550

ATACCAGTTC CAGGCCTGGG GAGAATGTGA CCTGAACACA GCCCTGAAGA   600

CCAGAACTGG AAGTCTGAAG CGAGCCCTGC ACAATGCCGA ATGCCAGAAG   650

ACTGTCACCA CTCCCAAGCC CTGTGGCAAA CTGACCAAGC CCAAACCTCA   700

AGCAGAATCT AAGAAGAAGA AAAAGGAAGG CAAGAAACAG GAGAAGATGC   750

TGGATTAAAA GATGTCACCT GTGGAACATA AAAAGGACAT CAGCAAACAG   800

GATCAGTTAA CTATTGCATT TATATGTACC GTAGGCTTTG TATTCAAAAA   850

TTATCTATAG CTAAGTACAC AATAAGCAAA AACAAAAGA AAAAAAAAAA   900

AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA   950

AAAAAAAAAA A                                            961
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